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(71) 出願人 000003207

トヨタ自動車株式会社

愛知県豊田市トヨタ町1番地

(72) 発明者 堀田 裕

愛知県豊田市トヨタ町1番地 トヨタ自動車株式会社内

(72) 発明者 尾沙賀 徹

愛知県豊田市トヨタ町1番地 トヨタ自動車株式会社内

(74) 代理人 100083091

弁理士 田淵 経雄

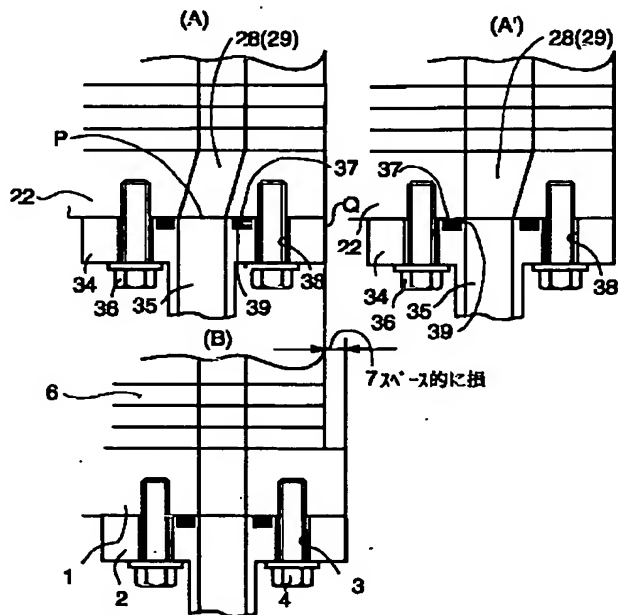
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(54) 【発明の名称】 燃料電池のマニホールド

(57) 【要約】

【課題】 省スペース化とシール性の両方を共に達成できる燃料電池のマニホールドの提供。

【解決手段】 (1) セル積層体の両端にエンドプレート22を配して構成しスタック23内に形成された流体のマニホールド28、29と、フランジ34を有しフランジ部でスタック23の一端のエンドプレート22にボルト締結された配管30、31内に形成されスタック内のマニホールドに連通する流体流路35と、からなる燃料電池のマニホールドであって、スタック内のマニホールド28、29のうち、スタック一端のエンドプレート22内のマニホールド部分は、セル積層方向に対して斜めに延びている燃料電池のマニホールド。(2) アノードガスと他の流体とで、リングで構成されるシールラインは互いに独立とするが、リングを押さえる配管フランジ34は互いに共通にした燃料電池のマニホールド。



【特許請求の範囲】

【請求項1】 セル積層体の両端にエンドプレートを配して構成したスタック内に形成された流体のマニホールドと、

フランジを有し該フランジ部で前記スタックの一端のエンドプレートにボルト締結された配管内に形成され前記スタック内のマニホールドに連通する流体流路と、からなる燃料電池のマニホールドであって、前記スタック内のマニホールドのうち、前記スタック一端のエンドプレート内のマニホールド部分は、セル積層方向に対して斜めに延びている燃料電池のマニホールド。

【請求項2】 前記配管のフランジ部分の流体流路の中心は前記スタックのセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしている請求項1記載の燃料電池のマニホールド。

【請求項3】 前記配管の前記スタックへの接続部で、アノードガスと他の流体とで、Oリングで構成されるシールラインは互いに独立とするが、前記Oリングを押さえる配管フランジは互いに共通にした請求項1記載の燃料電池のマニホールド。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、燃料電池のマニホールドに関し、とくに燃料電池スタック内のマニホールドとスタック外の配管内流路との接続部およびその近傍の構造に関する。

【0002】

【従来の技術】固体高分子電解質型燃料電池は、イオン交換膜からなる電解質膜とこの電解質膜の一面に配置された触媒層および拡散層からなる電極（アノード、燃料極）および電解質膜の他面に配置された触媒層および拡散層からなる電極（カソード、空気極）とからなる膜-電極アセンブリ（MEA：Membrane-Electrode Assembly）と、アノード、カソードに燃料ガス（アノードガス、水素）および酸化ガス（カソードガス、酸素、通常は空気）を供給するための流体通路を形成するセパレータとからセルを構成し、複数のセルを積層してモジュールとし、モジュールを積層してモジュール群を構成し、モジュール群のセル積層方向両端に、ターミナル、インシュレータ、エンドプレートを配置してスタックを構成し、スタックをスタックの外側でセル積層体積層方向に延びる締結部材（たとえば、テンションプレート）にて締め付け、固定したものからなる。固体高分子電解質型燃料電池では、アノード側で、水素が水素イオンと電子にされ、水素イオンは電解質膜中をカソード側に移動し、カソード側で酸素と水素イオンおよび電子（隣りのMEAのアノードで生成した電子がセパレータを通してくる）から水が生成される。

アノード側： $\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$

カソード側： $2\text{H}^+ + 2\text{e}^- + (1/2)\text{O}_2 \rightarrow \text{H}_2\text{O}$
 ジュール熱およびカソードでの水生成反応で出る熱を冷却するために、セパレータ間には、各セル毎にあるいは複数個のセル毎に、冷却媒体（通常は冷却水）が流れる流路が形成されており、燃料電池を冷却している。上記の反応が正常に行われるように、燃料ガス、酸化ガス、冷媒等の流体が、スタック外の配管を通してスタック内の流体が流れるマニホールドに供給、排出される。特許第3050408号は、スタック外配管の、燃料電池スタックへの取付けおよびスタック内マニホールドへの接続構造を開示している。

【0003】

【発明が解決しようとする課題】しかし、特許第3050408号のスタック外配管の燃料電池スタック内マニホールドへの接続構造では、エンドプレート内マニホールドを含むスタック内マニホールドとスタック外配管とが接続部とその近傍においてストレートに延びているので、スタック外配管にフランジを設けてスタック外配管をスタックのエンドプレートにボルト締結しようとする、図5のB部に示した比較例に示すように、ボルト穴部3を設ける必要があるエンドプレート1のサイズが、ボルト穴部が設けられないセル積層体6の部分に比べて、ボルト穴部3を設けるスペース7分、セル積層方向と直交方向に不要に大きくなり、スペース的に無駄（損）が生じる。また、省スペース化をはかろうとしてフランジ2のOリング5やボルト4を小さくしてOリングやボルトを設けるスペースを小さくすると、配管フランジ部でのシール性が低下したり配管取付け強度が不足する。したがって、従来構造では、省スペース化とシール性の両方を共に達成することは困難であった。本発明の目的は、省スペース化とシール性の両方を共に達成できる燃料電池のマニホールドを提供することにある。

【0004】

【課題を解決するための手段】上記目的を達成する本発明はつぎの通りである。

（1）セル積層体の両端にエンドプレートを配して構成したスタック内に形成された流体のマニホールドと、フランジを有し該フランジ部で前記スタックの一端のエンドプレートにボルト締結された配管内に形成され前記スタック内のマニホールドに連通する流体流路と、からなる燃料電池のマニホールドであって、前記スタック内のマニホールドのうち、前記スタック一端のエンドプレート内のマニホールド部分は、セル積層方向に対して斜めに延びている燃料電池のマニホールド。

（2）前記配管のフランジ部分の流体流路の中心は前記スタックのセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしている（1）記載の燃料電池のマニホールド。

（3）前記配管の前記スタックへの接続部で、アノ-

ドガスと他の流体とで、Ｏリングで構成されるシールラインは互いに独立とするが、前記Ｏリングを押さえる配管フランジは互いに共通にした(1)記載の燃料電池のマニホールド。

【0005】上記(1)の燃料電池のマニホールドでは、スタック内のマニホールドのうち、前記スタック一端のエンドプレート内のマニホールド部分は、セル積層方向に対して斜めに延びているので、セル積層体部位のマニホールドの配置は従来のまま、エンドプレート内マニホールド部分と配管内流路との接続部をセル積層体部位のマニホールドに対してセル積層方向と直交する方向にオフセットさせることができ、エンドプレート内マニホールド部分と配管内流路との接続部とエンドプレートのセル積層方向と直交する方向の端部との間に、従来よりも大きなスペースを確保することができ、その部分にフランジ部分やＯリング部分を小型化することなく容易に配設することができる。したがって、省スペース化とシール性の確保を共に達成することができる。上記

(2)の燃料電池のマニホールドでは、配管のフランジ部分の流体流路の中心が、スタックのセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしているため、エンドプレート内マニホールド部分と配管内流路との接続部とエンドプレートのセル積層方向と直交する方向の端部との間に、従来よりも大きなスペースを確保することができ、その部分にフランジ部分やＯリング部分を小型化することなく容易に配設することができる。したがって、省スペース化とシール性の確保を共に達成することができる。上記(3)の燃料電池のマニホールドでは、配管のスタックへの接続部で、アノードガスと他の流体とで、Ｏリングで構成されるシールラインは互いに独立とするが、Ｏリングを押さえる配管フランジは互いに共通にしたので、Ｏリングを通して他流体の流路ラインへのアノードガスの透過防止を確保したまま、フランジを共有化することでフランジ部、シール部を省スペース化できる。

【0006】

【発明の実施の形態】以下に、本発明の燃料電池を図1～図7を参照して、説明する。本発明の燃料電池10は固体高分子電解質型燃料電池である。本発明の燃料電池10は、たとえば燃料電池自動車に搭載される。ただし、自動車以外に用いられてもよい。

【0007】固体高分子電解質型燃料電池10は、図1、図2に示すように、イオン交換膜からなる電解質膜11とこの電解質膜11の一面に配置された触媒層12および拡散層13からなる電極14（アノード、燃料極）および電解質膜11の他面に配置された触媒層15および拡散層16からなる電極17（カソード、空気極）とからなる膜－電極アセンブリ（MEA：Membrane-Electrode Assembly）と、電極14、17に燃料ガ

ス（アノードガス、水素）および酸化ガス（カソードガス、酸素、通常は空気）を供給するための流体通路27（燃料ガス流路27A、酸化ガス流路27B）および燃料電池冷却用の冷媒（冷却水）が流れる冷媒流路（冷却水流路）26を形成するセパレータ18とを重ねてセルを形成し、該セルを複数積層してモジュール19とし、モジュール19を積層してモジュール群を構成し、モジュール19群のセル積層方向両端に、ターミナル20、インシュレータ21、エンドプレート22を配置してスタック23を構成し、スタック23を積層方向に締め付けセル積層体の外側で燃料電池積層体積層方向に延びる締結部材24（たとえば、テンションプレート、テンションプレートはスタック23の一部）とボルト25で固定したものからなる。冷媒流路26はセル毎に、または複数のセル毎に、設けられる。たとえば、2つのセル毎に1つの冷媒流路26が設けられる。

【0008】セパレータ18は、燃料ガスと酸化ガス、燃料ガスと冷却水、酸化ガスと冷却水、の何れかを互いに分離するとともに、隣り合うセルのアノードからカソードに電子が流れる電気の通路を形成している。セパレータ18は、カーボン板に冷媒流路26やガス流路27（燃料ガス流路27a、酸化ガス流路27b）を形成したもの、または、流路26、27を形成する凹凸のある金属板を複数枚重ね合わせたもの、または、導電製樹脂板（たとえば、導電材粒子を混入して導電性をもたせた樹脂板）に冷媒流路26やガス流路27を形成したもの、の何れかからなる。図示例はセパレータ18がカーボン板からなる場合を示している。セル内ガス流路27（燃料ガス流路27a、酸化ガス流路27b）は、1本の溝状流路、または並行する複数本の溝状流路の群、または複数突起により隔てられた一対の板間の面状流路、の何れであってもよい。

【0009】図3、図5、図6に示すように、燃料電池スタック23内には、冷媒マニホールド28が設けられており、冷媒マニホールド28はセルの冷媒流路26に連通している。冷媒は入側の冷媒マニホールド28から冷媒流路26に流れ、冷媒流路26から出側の冷媒マニホールド28に流れる。同様に、燃料電池スタック23内には、ガスマニホールド29が設けられており、ガスマニホールド29は燃料ガスマニホールド29aと酸化ガスマニホールド29bとからなる。燃料ガスマニホールド29aと酸化ガスマニホールド29bは、それぞれ、セルの燃料ガス流路27aと酸化ガス流路27bに連通している。燃料ガスは入側の燃料ガスマニホールド29aからセルの燃料ガス流路27aに流れ、燃料ガス流路27aから出側の燃料ガスマニホールド29aに流れる。酸化ガスは入側の酸化ガスマニホールド29bからセルの酸化ガス流路27bに流れ、酸化ガス流路27bから出側の酸化ガスマニホールド29bに流れる。

【0010】スタック23は2列並列に水平に配置され

てもよく、その場合は、スタック23の両端のエンドプレート22は、2列のスタック23に対して共有される。スタック23の一端にあるエンドプレート22には、冷媒（冷却水）を燃料電池スタック23内の冷媒マニホール28に供給・排出する冷媒配管30が接続されており、反応ガスを燃料電池スタック内のガスマニホール29に供給・排出するガス配管31が接続されている。ガス配管31は、燃料ガスを燃料電池スタック内の燃料ガスマニホール29aに供給・排出する燃料ガス配管31aと、酸化ガスを燃料電池スタック内の酸化ガスマニホール29bに供給・排出する酸化ガス配管31bとからなる。冷媒、燃料ガス、酸化ガスは、スタック23の一端にあるエンドプレート22から燃料電池スタックに入り、Uターンして、同じエンドプレート22から出る。

【0011】1スタック燃料電池の場合、冷媒（冷却水）は入側冷媒配管30からエンドプレート22の左右方向端部の下部でスタック23に入り、スタック23からエンドプレート22の左右方向端部の上部で出側冷媒配管30に流出する。燃料ガスは、入側燃料ガス配管31aからエンドプレート22の左右方向端部の上部でスタック23に入り、スタック23からエンドプレート22の左右方向端部の下部で出側燃料ガス配管31aに流出する。酸化ガスは、入側酸化ガス配管31bからエンドプレート22の左右方向端部の下部でスタック23に入り、スタック23からエンドプレート22の左右方向端部の上部で出側酸化ガス配管31bに流出する。2スタック燃料電池の場合、上記の配管配置をとる1スタック燃料電池を2つ、入側、出側燃料ガス配管31aを中央側に配置して左右対称に配置し、エンドプレートは左右のスタックに対して共通に1つ設けた構造をとる。

【0012】スタック23の他端にあるエンドプレート22の内側には、プレッシャプレート32が設けられ、プレッシャプレート32とエンドプレート22との間にはスタック締め付け荷重の変動を吸収するばね機構（たとえば、皿ばね機構）33が設けられる。スタック23の他端にあるエンドプレート22側には、冷媒、反応ガスの配管は接続されない。

【0013】図3～図5に示すように、スタック23内に形成された流体のマニホール28、29と、フランジ34を有しフランジ部でスタック23の一端のエンドプレート22にボルト36で締結された配管30、31内に形成されスタック23内のマニホール28、29に連通する流体流路35と、からなる燃料電池のマニホールにおいて、スタック23内のマニホール28、29のうち、スタック一端のエンドプレート22にあるマニホール部分は、セル積層方向に対して斜めに延びている。エンドプレート22内マニホール部分は、マニホール軸芯が斜めに延びていけばよく、図5の（A）に示すようにマニホール軸芯を挟んでマニホー

ルド両側壁面が平行に斜めに延びている場合を含む他、図5の（A'）に示すように、マニホール軸芯を挟んだマニホール両側壁面のうち一方の側壁面がセル積層方向に延び他方の側壁面が斜めに（セル積層方向外側にいくほどエンドプレート中央に近づく方向）延びている場合も含む。

【0014】配管30、31のフランジ34部分の流体流路35の中心は、スタック23のセル積層体部分のマニホール28、29の中心に対してセル積層方向と直交する方向にスタック中心側に（エンドプレート端部から離れる方向に）オフセットしている。スタック一端のエンドプレート22内でセル積層方向に対して斜めに延びるマニホール部分は、スタック一端のエンドプレート22の左右方向端部にあるマニホール部分である。したがって、2スタックを並列配置したスタックの一端部に左右スタックに対して共通に設けられる単一のエンドプレート22においては、エンドプレートの左右方向中央部側に設けられるマニホール部分は、斜めに延びる必要はない。

【0015】配管30、31のフランジ34には、ボルト穴38が形成されるとともに、リング溝39が形成され、リング溝39にはリング37が配されて、配管30、31とフランジ34との合わせ部をシールしている。フランジ34、ボルト穴38、リング溝39、リング37のそれぞれの大きさとそれぞれの間の間隔は、図5の（B）の比較例（斜めに延びるマニホールがない）に示した、シール性および強度上必要な大きさおよび間隔と等しいかまたはそれより大である。その場合、図5の（B）の比較例では、フランジ端部がセル積層体の端部より外側にくるが、図5の（A）、（A'）の本発明実施例では、フランジ端部がほぼセル積層体の端部の位置にくる。

【0016】また、図6、図7に示すように、配管30、31のスタック23への接続部で、アノードガスと他の流体とで、リング37で構成されるシールライン（リング溝39ライン）は互いに独立であるが、リング37を押さえる配管フランジ34は互いに共通にしてある。フランジ34の共通としたことにより、アノードガスのマニホールとそれと隣接するマニホールとの間にあるボルト40は、図4に示した4本から図7に示すように2本としてもよい。ボルト2本とした場合は、ボルト4本に比べて更なる省スペース化がはかられ、配管取付け構造が簡素化される。

【0017】つぎに、本発明実施例の燃料電池のマニホールの作用を説明する。まず、スタック23内のマニホール28、29のうち、スタック一端のエンドプレート22内のマニホール部分は、セル積層方向に対して斜めに延びているので、セル積層体部位のマニホールの配置は従来そのままにして、エンドプレート22内マニホール28、29部分と配管内流路35との接続部

Pをセル積層体部位のマニホールドに対してセル積層方向と直交する方向にオフセット（位置をずらす）させることができ、エンドプレート22内マニホールド部分と配管内流路35との接続部Pとエンドプレート22のセル積層方向と直交する方向の端部Qとの間に、図5の比較例Bの場合（エンドプレート内マニホールドが斜めに延びていない場合）よりも大きなスペースを確保することができ、その部分にフランジ34部分やOリング37部分を小型化することなく容易に配設することができる。したがって、省スペース化を達成できるとともに、十分なシール性を確保することができる。

【0018】オフセットされる場合、配管30、31のフランジ34部分の流体流路35の中心Pが、スタック23のセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしているので、エンドプレート22内マニホールド部分と配管内流路35との接続部Pとエンドプレート22のセル積層方向と直交する方向の端部Qとの間に、図5の比較例Bの場合（エンドプレート内マニホールドが斜めに延びていない場合）よりも大きなスペースを確保することができ、その部分にフランジ34部分やOリング37部分を配設することが無理なく可能となる。したがって、省スペース化とシール性の確保が共に達成される。

【0019】また、図6、図7の燃料電池のマニホールドでは、配管30、31のスタック23への接続部で、アノードガスと他の流体とで、Oリング37で構成されるシールラインが互いに独立とされているため、Oリング37を通しての、水素ガスの他の流体のマニホールドへの透過を防ぐことができる。また、Oリング37を押さえる配管フランジ34を互いに共通にしたので、フランジ部、シール部が省スペース化される。

【0020】

【発明の効果】請求項1の燃料電池のマニホールドによれば、スタック内のマニホールドのうち、スタック一端のエンドプレート内のマニホールド部分が、セル積層方向に対して斜めに延びているので、セル積層体部位のマニホールドの配置は従来のまま、エンドプレート内マニホールド部分と配管内流路との接続部をセル積層体部位のマニホールドに対してセル積層方向と直交する方向にオフセットさせることができる。その結果、エンドプレート内マニホールド部分と配管内流路との接続部とエンドプレートのセル積層方向と直交する方向の端部との間に、従来よりも大きなスペースを確保することができ、その部分にフランジ部分やOリング部分を小型化することなく容易に配設することができる。したがって、省スペース化とシール性の確保を共に達成することができる。請求項2の燃料電池のマニホールドによれば、配管のフランジ部分の流体流路の中心が、スタックのセル積層体部分のマニホールドの中心に対してセル積層方向と

直交する方向にスタック中心側にオフセットしているので、エンドプレート内マニホールド部分と配管内流路との接続部とエンドプレートのセル積層方向と直交する方向の端部との間に、従来よりも大きなスペースを確保することができ、その部分にフランジ部分やOリング部分を小型化することなく容易に配設することができる。したがって、省スペース化とシール性の確保を共に達成することができる。請求項3の燃料電池のマニホールドによれば、配管のスタックへの接続部で、アノードガスと他の流体とで、Oリングで構成されるシールラインは互いに独立とするが、Oリングを押さえる配管フランジは互いに共通にしたので、Oリングを通しての他流体の流路ラインへのアノードガスの透過防止を確保したまま、フランジを共有化することでフランジ部、シール部を省スペース化できる。

【図面の簡単な説明】

【図1】本発明の燃料電池のマニホールドが適用された燃料電池の側面図である。

【図2】図1の燃料電池の一部分の拡大断面図である。

【図3】本発明の燃料電池のマニホールドが適用された燃料電池の斜視図である。

【図4】図3の燃料電池の、配管が取付けられる側のエンドプレート側から見た正面図である。

【図5】図4の燃料電池の、（A）A-A線に沿う断面図（本発明）、（A'）本発明に含むもう一つの例、および（B）比較例（比較例は本発明に含まず）の断面図である。

【図6】本発明の燃料電池のマニホールドが適用された燃料電池の斜視図である。

【図7】図6の燃料電池の一端のエンドプレート部とそれに取り付けられる配管のフランジの一部の斜視図である。

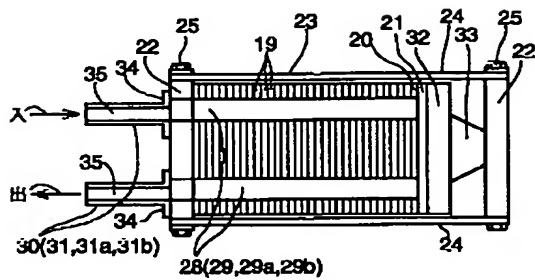
【符号の説明】

- 10 （固体高分子電解質型）燃料電池
- 11 電解質膜
- 12 触媒層
- 13 拡散層
- 14 電極（アノード、燃料極）
- 15 触媒層
- 16 拡散層
- 17 電極（カソード、空気極）
- 18 セパレータ
- 19 モジュール
- 20 ターミナル
- 21 インシュレータ
- 22 エンドプレート
- 23 スタック
- 24 テンションプレート
- 25 ボルト
- 26 冷媒流路

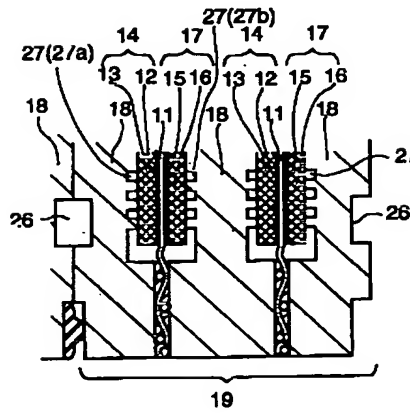
- 27 ガス流路
- 27 a 燃料ガス流路
- 27 b 酸化ガス流路
- 28 冷媒マニホール
- 29 ガスマニホール
- 29 a 燃料ガスマニホール
- 29 b 酸化ガスマニホール
- 30 冷媒配管
- 31 ガス配管
- 31 a 燃料ガス配管

- 31 b 酸化ガス配管
- 32 プレッシュプレート
- 33 ばね機構
- 34 フランジ
- 35 配管内の流体流路
- 36 ボルト
- 37 Oリング
- 38 ボルト穴
- 39 Oリング溝

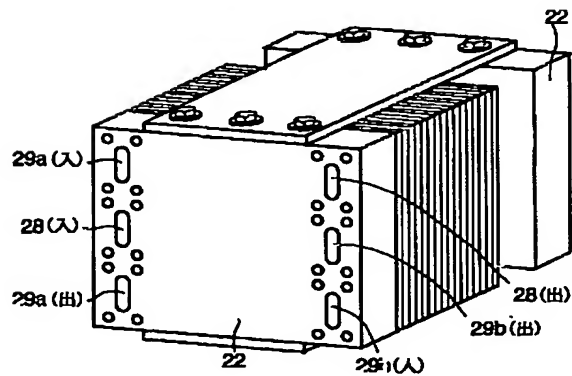
【図1】



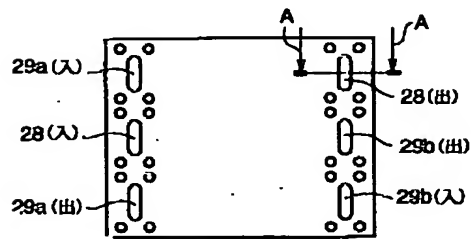
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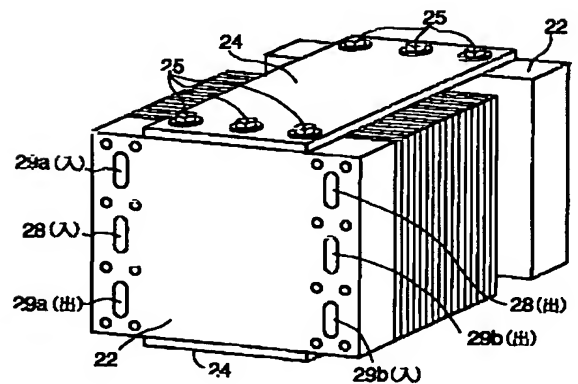
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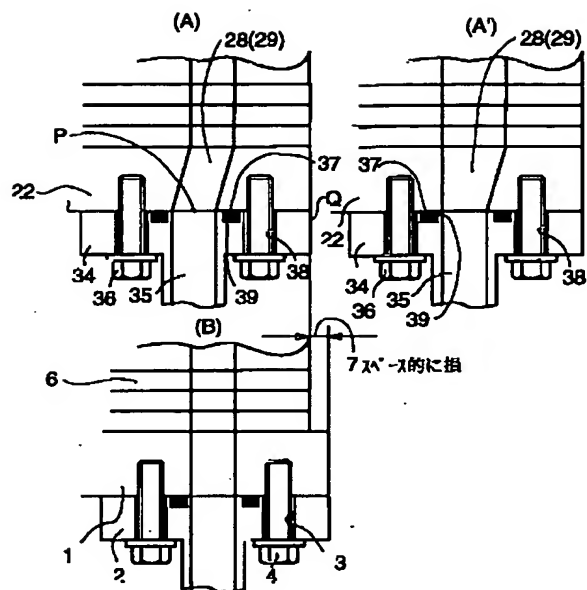
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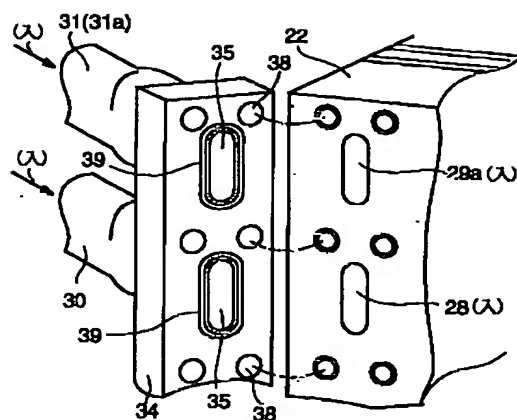
【図6】



【図5】



【図7】



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DETAIL

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LEGAL
STATUS

1 / 1

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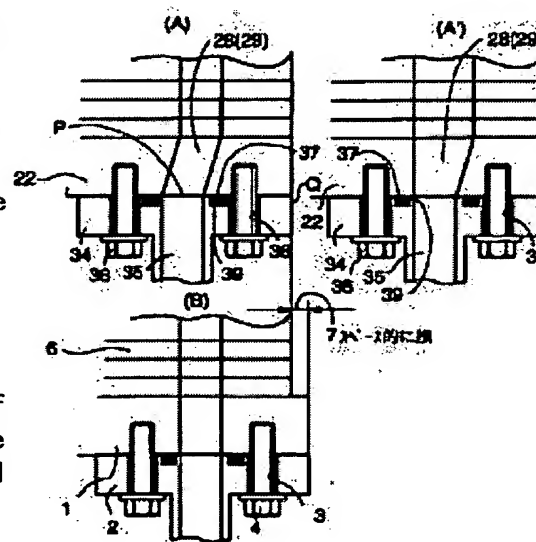
(72)Inventor : HOTTA YUTAKA
KONSAGA TORU

(54) MANIFOLD FOR FUEL CELL

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a manifold for fuel cell capable of attaining both space saving and sealing property.

SOLUTION: (1) This manifold for fuel cell comprises fluid manifolds 28 and 29, formed into a stack 23 constituted with end plates 22 arranged on both ends of a cell laminate, and a fluid passage 35 formed in pipes 30 and 31, having a flange 34 and bolted to the end plate 22 at one end of the stack 23 in the flange part, the fluid passage communicating with the manifold within the stack. Of the manifolds 28 and 29 inside the stack, the manifold part within the end plate 22 at one end of the stack is extended obliquely with respect to the cell laminating direction. (2) In the manifold for fuel cell, although the seal line formed by an O-ring is set mutually independent between anode gas and the other fluid, the pipe flange 34 for pressing the O-ring is mutually shared.



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CLAIMS

[Claim(s)]

[Claim 1]A manifold of a fuel cell with which it is a manifold of a fuel cell and a manifold part in an end plate of said stack end is aslant prolonged to a cell laminating direction among manifolds in said stack characterized by comprising the following.

A manifold of a fluid formed in a stack which arranged and constituted an end plate to both ends of a cell layered product.

A fluid passage which is formed in piping by which has a flange and the bolting join was carried out to an end plate of an end of said stack by this flange, and is open for free passage to a manifold in said stack.

[Claim 2]A manifold of the fuel cell according to claim 1 which has offset the center of a fluid passage of a flange part of said piping at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of said stack.

[Claim 3]A manifold of the fuel cell according to claim 1 which made mutual a piping flange which presses down said O ring in common although a seal line which comprises anode gas and other fluids with an O ring in a terminal area to said stack of said piping is mutually-independent.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]Especially this invention relates to the terminal area of the manifold in a fuel cell stack, and the channel in piping besides a stack, and the structure of the neighborhood about the manifold of a fuel cell.

[0002]

[Description of the Prior Art]the electrode (an anode.) which consists of the catalyst bed and diffusion zone which have been arranged at the whole surface of the electrolyte membrane which a solid polyelectrolyte type fuel cell becomes from an ion-exchange membrane, and this electrolyte membrane with the film-electrode assembly (MEA:Membrane-Electrode Assembly) which consists of an electrode (a cathode, an air pole) which consists of the catalyst bed and diffusion zone of a fuel electrode and an electrolyte membrane which were alike on the other hand and have been arranged. an anode and a cathode -- fuel gas (anode gas, hydrogen) and oxidizing gas (cathode gas.) A cell is constituted from a separator which forms oxygen and the fluid channel for usually supplying air, Laminate two or more cells, consider it as a module, laminate a module, and a module group is constituted, A terminal, an insulator, and an end plate are arranged to the cell laminating direction both ends of a module group, and a stack is constituted, and a stack is bound tight in the fastening member (for example, tension plate) prolonged in a cell layered product laminating direction on the outside of a stack, and it consists of what was fixed. In a solid polyelectrolyte type fuel cell, hydrogen is used as a hydrogen ion and an electron by the anode side, a hydrogen ion moves the inside of an electrolyte membrane to the cathode side, and water is generated by the cathode side from oxygen, a hydrogen ion, and an electron (the electron generated with the anode of the next MEA lets a separator pass). anode side: $\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$ cathode side:, in order to cool the heat which comes out by the

water generation reaction in $2\text{H}^+ + 2\text{e}^- + (1/2) \text{O}_2 \rightarrow \text{H}_2\text{O}$ Joule heat and a cathode, between separators -- every cell -- or the channel through which a cooling medium (usually cooling water) flows is formed for two or more cells of every.

The fuel cell is cooled.

Fluids, such as fuel gas, oxidizing gas, and a refrigerant, are supplied and discharged by the manifold with which the fluid in a stack flows through piping besides a stack so that the above-mentioned reaction may be performed normally. The patent No. 3050408 is indicating the attachment to the fuel cell stack of piping stack outside, and the connection structure to the manifold in a stack.

[0003]

[Problem(s) to be Solved by the Invention]However, in the connection structure to the manifold in a fuel cell stack of piping outside [stack] the patent No. 3050408. Since the manifold in a stack containing the manifold in an end plate and piping stack outside are straight prolonged in a terminal area and its neighborhood, If a flange tends to be provided in piping stack outside and it is going to carry out the bolting join of the piping stack outside to the end plate of a stack, As shown in the comparative example shown in the B section of drawing 5, the size of the end plate

1 which needs to form the bolt hole 3, Compared with the portion of the cell layered product 6 in which a bolt hole is not provided, it becomes large unnecessarily in a cell laminating direction and direction crossing at a right angle for space 7 minutes which forms the bolt hole 3, and futility (disadvantage) arises in space. If the space which tries to achieve space-saving-ization and O ring 5 and the bolt 4 of the flange 2 are made small and in which an O ring and a bolt are formed is made small, the sealing nature in a piping flange part falls, or piping erection intensity runs short. Therefore, it was difficult to attain both space-saving-izing and sealing nature both with structure conventionally. The purpose of this invention is to provide the manifold of the fuel cell which can attain both space-saving-izing and sealing nature both.

[0004]

[Means for Solving the Problem] This invention which attains the above-mentioned purpose is as follows.

(1) A manifold of a fluid formed in a stack which arranged and constituted an end plate to both ends of a cell layered product, A fluid passage which is formed in piping by which has a flange and the bolting join was carried out to an end plate of an end of said stack by this flange, and is open for free passage to a manifold in said stack, A manifold of a fuel cell with which it is a manifold of a fuel cell, ** and others, and a manifold part in an end plate of said stack end is aslant prolonged to a cell laminating direction among manifolds in said stack.

(2) A manifold of a fuel cell given in (1) which has offset the center of a fluid passage of a flange part of said piping at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of said stack.

(3) said — piping — said — a stack — a terminal area — anode gas — others — a fluid — an O ring — constituting — having — a seal line — being mutually-independent — carrying out — although — said — an O ring — pressing down — a piping flange — mutual — community — having carried out — (— one —) — a description — a fuel cell — a manifold .

[0005] In a manifold of a fuel cell of the above (1), a manifold part in an end plate of said stack end among manifolds in a stack, Since it has extended aslant to a cell laminating direction, with the former [arrangement / of a manifold of a cell layered product part], A terminal area of a manifold part in an end plate and a channel in piping can be made to offset in the direction which intersects perpendicularly with a cell laminating direction to a manifold of a cell layered product part, Between ends of a direction which intersects perpendicularly with a terminal area of a manifold part in an end plate, and a channel in piping, and a cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Since the center of a fluid passage of a flange part of piping has offset in a manifold of a fuel cell of the above (2) at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of a stack, Between ends of a direction which intersects perpendicularly with a terminal area of a manifold part in an end plate, and a channel in piping, and a cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion.

Therefore, both space-saving-izing and sealing nature reservation can be attained. Although it supposes that a seal line which comprises anode gas and other fluids with an O ring in a terminal area to a stack of piping is mutually-independent in a manifold of a fuel cell of the above (3), - izing of a flange and the seal part can be carried out [space-saving] by sharing a flange, securing prevention from a penetration of anode gas to a channel line of other fluids which let an O ring pass, since a piping flange which presses down an O ring was made mutual in common.

[0006]

[Embodiment of the Invention] Below, the fuel cell of this invention is explained with reference to drawing 1 - drawing 7. The fuel cell 10 of this invention is a solid polyelectrolyte type fuel cell. The fuel cell 10 of this invention is carried, for example in a fuel cell electric vehicle. However, it may be used in addition to a car.

[0007] the electrode 14 (an anode.) which consists of the catalyst bed 12 and the diffusion zone

13 which have been arranged at the whole surface of the electrolyte membrane 11 which consists of ion-exchange membranes, and this electrolyte membrane 11 as the solid polyelectrolyte type fuel cell 10 is shown in drawing 1 and drawing 2 the electrode 17 (a cathode.) which consists of the catalyst bed 15 and the diffusion zone 16 of a fuel electrode and the electrolyte membrane 11 which were alike on the other hand and have been arranged The film-electrode assembly (MEA:Membrane-Electrode Assembly) which consists of air poles, the electrodes 14 and 17 — fuel gas (anode gas, hydrogen) and oxidizing gas (cathode gas.) oxygen and the fluid channel 27 (the fuel gas flow route 27A.) for usually supplying air A cell is formed for the separator 18 which forms the refrigerant passage (circulating-water-flow way) 26 through which the refrigerant the oxidizing gas passage 27B and for fuel cell cooling (cooling water) flows in piles, Carry out the plural laminates of this cell, consider it as the module 19, laminate the module 19, and a module group is constituted, The fastening member 24 (for example) which arranges the terminal 20, the insulator 21, and the end plate 22, constitutes the stack 23, binds the stack 23 tight to a laminating direction, and is prolonged on the outside of a cell layered product to the cell laminating direction both ends of module 19 group in a fuel cell layered product laminating direction A tension plate and a tension plate consist of what was fixed with the part and the bolt 25 of the stack 23. The refrigerant passage 26 is formed for every cell or two or more cells of every. For example, the one refrigerant passage 26 is formed every two cells.

[0008]The separator 18 forms the electric passage through which an electron flows into a cathode from the anode of an adjacent cell while separating mutually any of fuel gas, oxidizing gas and fuel gas, cooling water and oxidizing gas, and cooling water ** they are. That by which the separator 18 formed the refrigerant passage 26 and the gas passageway 27 (the fuel gas flow route 27a, the oxidizing gas passage 27b) in the carbon plate, Or it consists of either a thing which piled up two or more metal plates with the unevenness which forms the channels 26 and 27, or what [formed the refrigerant passage 26 and the gas passageway 27 in the resin board made from electric conduction (for example, resin board which mixed conducting material particles and gave conductivity)] **. The example of a graphic display shows the case where the separator 18 consists of carbon plates. The gas passageways 27 (the fuel gas flow route 27a, the oxidizing gas passage 27b) in a cell may be any of surface state channel ** between the group of one grooved channel or two or more parallel grooved channels, or the board of the couple separated by two or more projections.

[0009]As shown in drawing 3, drawing 5, and drawing 6, the refrigerant manifold 28 is formed in the fuel cell stack 23, and the refrigerant manifold 28 is open for free passage to the refrigerant passage 26 of a cell. A refrigerant flows into the refrigerant passage 26 from the refrigerant manifold 28 by the side of ON, and flows into the refrigerant manifold 28 by the side of appearance from the refrigerant passage 26. Similarly, the gas manifold 29 is formed in the fuel cell stack 23, and the gas manifold 29 consists of the fuel gas manifold 29a and the oxidation gas manifold 29b. The fuel gas manifold 29a and the oxidation gas manifold 29b are open for free passage to the fuel gas flow route 27a and the oxidizing gas passage 27b of a cell, respectively. Fuel gas flows into the fuel gas flow route 27a of a cell from the fuel gas manifold 29a by the side of ON, and flows into the fuel gas manifold 29a by the side of appearance from the fuel gas flow route 27a. Oxidizing gas flows into the oxidizing gas passage 27b of a cell from the oxidation gas manifold 29b by the side of ON, and flows into the oxidation gas manifold 29b by the side of appearance from the oxidizing gas passage 27b.

[0010]The stack 23 may be arranged at a level with two-row parallel, and the end plate 22 of the both ends of the stack 23 is shared to the stack 23 of two rows in that case. In the end plate 22 in the end of the stack 23. The refrigerant piping 30 supplied and discharged is connected to the refrigerant manifold 28 in the fuel cell stack 23 in the refrigerant (cooling water), and the gas piping 31 which supplies and discharges reactant gas at the gas manifold 29 in a fuel cell stack is connected. The gas piping 31 consists of the fuel gas piping 31a which supplies and discharges fuel gas at the fuel gas manifold 29a in a fuel cell stack, and the oxidizing gas piping 31b which supplies and discharges oxidizing gas at the oxidation gas manifold 29b in a fuel cell stack. A refrigerant, fuel gas, and oxidizing gas enter and make a U-turn to a fuel cell stack from the end

plate 22 in the end of the stack 23, and come out of the same end plate 22.

[0011]In the case of 1 stack fuel cell, a refrigerant (cooling water) goes into the stack 23 in the lower part of the longitudinal-direction end of the end plate 22 from the ON side refrigerant piping 30, and flows out of the stack 23 into the appearance side refrigerant piping 30 in the upper part of the longitudinal-direction end of the end plate 22. Fuel gas goes into the stack 23 in the upper part of the longitudinal-direction end of the end plate 22 from the ON side fuel gas piping 31a, and flows out of the stack 23 into the appearance side fuel gas piping 31a in the lower part of the longitudinal-direction end of the end plate 22. Oxidizing gas goes into the stack 23 in the lower part of the longitudinal-direction end of the end plate 22 from the ON side oxidizing gas piping 31b, and flows out of the stack 23 into the appearance side oxidizing gas piping 31b in the upper part of the longitudinal-direction end of the end plate 22. In the case of 2 stack fuel cell, the appearance side fuel gas piping 31a is arranged to a central site, a two and ON side arranges symmetrically 1 stack fuel cell for which the above-mentioned piping configuration is taken, and, as for an end plate, the structure established one in common to the stack on either side is taken.

[0012]The pressure plate 32 is formed inside the end plate 22 in the other end of the stack 23, and the spring mechanism (for example, belleville spring mechanism) 33 which absorbs change of stack clamp load is formed between the pressure plate 32 and the end plate 22. Piping of a refrigerant and reactant gas is not connected to the end-plate 22 side in the other end of the stack 23.

[0013]The manifolds 28 and 29 of the fluid formed in the stack 23 as shown in drawing 3 - drawing 5. The fluid passage 35 which is formed in the piping 30 and 31 which has the flange 34 and was concluded by the end plate 22 of the end of the stack 23 with the bolt 36 by the flange, and is open for free passage to the manifolds 28 and 29 in the stack 23. In the manifold of the fuel cell, ** and others, the manifold part which is in the end plate 22 of a stack end among the manifolds 28 and 29 in the stack 23 is aslant prolonged to the cell laminating direction. As for the manifold part in the end plate 22, the manifold axis should just be prolonged aslant. As shown in (A) of drawing 5, include the case where the manifold each-side-walls side has extended aslant in parallel on both sides of the manifold axis, and also as shown in (A') of drawing 5. It contains, also when one wall surface extends in a cell laminating direction among the manifold each-side-walls sides which sandwiched the manifold axis and the wall surface of another side has extended aslant (direction which approaches in the center of an end plate, so that it goes to the cell laminating direction outside).

[0014]The center of the fluid passage 35 of flange 34 portion of the piping 30 and 31 is offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifolds 28 and 29 of the cell layered product portion of the stack 23 (in direction which separates from an end-plate end). The manifold part aslant prolonged to a cell laminating direction within the end plate 22 of a stack end is a manifold part in the longitudinal-direction end of the end plate 22 of a stack end. Therefore, in the single end plate 22 provided in the end part of the stack which carried out parallel arrangement of the two stacks in common to a right-and-left stack, the manifold part provided in the longitudinal-direction center-section side of the end plate does not need to be prolonged aslant.

[0015]While the bolthole 38 is formed, O ring groove 39 is formed in the flange 34 of the piping 30 and 31, O ring 37 is arranged on O ring groove 39, and the seal of the doubling part of the piping 30 and 31 and the flange 34 is carried out to it. Each size of the flange 34, the bolthole 38, the O link groove 39, and O ring 37 and the interval between each are equal to a required size and interval on the sealing nature and intensity which were shown in the comparative example of (B) of drawing 5 (there is no manifold prolonged aslant), or size from it. In that case, although a flange end part comes by the comparative example of (B) of drawing 5 outside the end of a cell layered product, a flange end part comes to the position of the end of a cell layered product by this invention working example of (A) of drawing 5, and (A') mostly.

[0016]As shown in drawing 6 and drawing 7, the seal line (O ring groove of 39 lines) which comprises anode gas and other fluids with O ring 37 in the terminal area to the stack 23 of the piping 30 and 31 is mutually-independent, but the piping flange 34 which presses down O ring 37

is made mutual in common. By [of the flange 34] having presupposed that it is common, the bolt 40 between the manifolds which adjoin the manifold of anode gas and it is good also as two, as shown in drawing 7 from four were shown in drawing 4. When it is considered as two bolts, the further space-saving-ization is achieved compared with four bolts, and piping erection structure is simplified.

[0017]Below, an operation of the manifold of the fuel cell of this invention working example is explained. First, the manifold part in the end plate 22 of the stack end among the manifolds 28 and 29 in the stack 23, Since it has extended aslant to the cell laminating direction, arrangement of the manifold of a cell layered product part is left the former, The terminal area P of the manifold 28 in the end plate 22, 29 portions, and the channel 35 in piping can be made to offset in the direction which intersects perpendicularly with a cell laminating direction to the manifold of a cell layered product part (a position is shifted), Between the ends Q of the direction which intersects perpendicularly with the terminal area P of the manifold part in the end plate 22, and the channel 35 in piping, and the cell laminating direction of the end plate 22, A bigger (when the manifold in an end plate is not prolonged aslant) space than the case of the comparative example B of drawing 5 is securable, and it can allocate easily, without miniaturizing flange 34 portion and O ring 37 portion into the portion. Therefore, while being able to attain space-saving-ization, sufficient sealing nature is securable.

[0018]When offset, the center P of the fluid passage 35 of flange 34 portion of the piping 30 and 31. Since it has offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifold of the cell layered product portion of the stack 23, Between the ends Q of the direction which intersects perpendicularly with the terminal area P of the manifold part in the end plate 22, and the channel 35 in piping, and the cell laminating direction of the end plate 22, A bigger (when the manifold in an end plate is not prolonged aslant) space than the case of the comparative example B of drawing 5 can be secured, and it becomes it is reasonable and possible to allocate flange 34 portion and O ring 37 portion in the portion. Therefore, both space-saving-izing and sealing nature reservation are attained.

[0019]In the manifold of the fuel cell of drawing 6 and drawing 7. Since the seal line which comprises anode gas and other fluids with O ring 37 in the terminal area to the stack 23 of the piping 30 and 31 is made mutually-independent, the penetration to the manifold of other fluids of hydrogen gas which let O ring 37 pass can be prevented. Since the piping flange 34 which presses down O ring 37 was made mutual in common, a flange and a seal part are made space-saving.

[0020]

[Effect of the Invention]Since the manifold part in the end plate of a stack end is aslant prolonged to the cell laminating direction among the manifolds in a stack according to the manifold of the fuel cell of Claim 1, The arrangement of the manifold of a cell layered product part can make the terminal area of the manifold part in an end plate, and the channel in piping offset in the direction which intersects perpendicularly with a cell laminating direction to the manifold of a cell layered product part in the conventional state. As a result, between the ends of the direction which intersects perpendicularly with the terminal area of the manifold part in an end plate, and the channel in piping, and the cell laminating direction of an end plate, A bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Since the center of the fluid passage of the flange part of piping has offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifold of the cell layered product portion of a stack according to the manifold of the fuel cell of Claim 2, Between the ends of the direction which intersects perpendicularly with the terminal area of the manifold part in an end plate, and the channel in piping, and the cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Although [according to the manifold of the fuel cell of Claim 3] the seal line which comprises

anode gas and other fluids with an O ring in the terminal area to the stack of piping is mutually-independent, -izing of a flange and the seal part can be carried out [space-saving] by sharing a flange, securing the prevention from a penetration of the anode gas to the channel line of the other fluids which let an O ring pass, since the piping flange which presses down an O ring was made mutual in common.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]Especially this invention relates to the terminal area of the manifold in a fuel cell stack, and the channel in piping besides a stack, and the structure of the neighborhood about the manifold of a fuel cell.

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PRIOR ART

[Description of the Prior Art]the electrode (an anode.) which consists of the catalyst bed and diffusion zone which have been arranged at the whole surface of the electrolyte membrane which a solid polyelectrolyte type fuel cell becomes from an ion-exchange membrane, and this electrolyte membrane with the film-electrode assembly (MEA:Membrane-Electrode Assembly) which consists of an electrode (a cathode, an air pole) which consists of the catalyst bed and diffusion zone of a fuel electrode and an electrolyte membrane which were alike on the other hand and have been arranged. an anode and a cathode — fuel gas (anode gas, hydrogen) and oxidizing gas (cathode gas.) A cell is constituted from a separator which forms oxygen and the fluid channel for usually supplying air, Laminate two or more cells, consider it as a module, laminate a module, and a module group is constituted, A terminal, an insulator, and an end plate are arranged to the cell laminating direction both ends of a module group, and a stack is constituted, and a stack is bound tight in the fastening member (for example, tension plate) prolonged in a cell layered product laminating direction on the outside of a stack, and it consists of what was fixed. In a solid polyelectrolyte type fuel cell, hydrogen is used as a hydrogen ion and an electron by the anode side, a hydrogen ion moves the inside of an electrolyte membrane to the cathode side, and water is generated by the cathode side from oxygen, a hydrogen ion, and an electron (the electron generated with the anode of the next MEA lets a separator pass). anode side: — $H_2 \rightarrow 2H^+ + 2e^-$ cathode side:, in order to cool the heat which comes out by the water generation reaction in $2H^+ + 2e^- + (1/2) O_2 \rightarrow H_2O$ Joule heat and a cathode, between separators — every cell — or the channel through which a cooling medium (usually cooling water) flows is formed for two or more cells of every. The fuel cell is cooled.

Fluids, such as fuel gas, oxidizing gas, and a refrigerant, are supplied and discharged by the manifold with which the fluid in a stack flows through piping besides a stack so that the above-mentioned reaction may be performed normally. The patent No. 3050408 is indicating the attachment to the fuel cell stack of piping stack outside, and the connection structure to the manifold in a stack.

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EFFECT OF THE INVENTION

[Effect of the Invention] Since the manifold part in the end plate of a stack end is aslant prolonged to the cell laminating direction among the manifolds in a stack according to the manifold of the fuel cell of Claim 1, The arrangement of the manifold of a cell layered product part can make the terminal area of the manifold part in an end plate, and the channel in piping offset in the direction which intersects perpendicularly with a cell laminating direction to the manifold of a cell layered product part in the conventional state. As a result, between the ends of the direction which intersects perpendicularly with the terminal area of the manifold part in an end plate, and the channel in piping, and the cell laminating direction of an end plate, A bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Since the center of the fluid passage of the flange part of piping has offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifold of the cell layered product portion of a stack according to the manifold of the fuel cell of Claim 2, Between the ends of the direction which intersects perpendicularly with the terminal area of the manifold part in an end plate, and the channel in piping, and the cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Although [according to the manifold of the fuel cell of Claim 3] the seal line which comprises anode gas and other fluids with an O ring in the terminal area to the stack of piping is mutually-independent, -izing of a flange and the seal part can be carried out [space-saving] by sharing a flange, securing the prevention from a penetration of the anode gas to the channel line of the other fluids which let an O ring pass, since the piping flange which presses down an O ring was made mutual in common.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the connection structure to the manifold in a fuel cell stack of piping outside [stack] the patent No. 3050408. Since the manifold in a stack containing the manifold in an end plate and piping stack outside are straight prolonged in a terminal area and its neighborhood, If a flange tends to be provided in piping stack outside and it is going to carry out the bolting join of the piping stack outside to the end plate of a stack, As shown in the comparative example shown in the B section of drawing 5, the size of the end plate 1 which needs to form the bolt hole 3, Compared with the portion of the cell layered product 6 in which a bolt hole is not provided, it becomes large unnecessarily in a cell laminating direction and direction crossing at a right angle for space 7 minutes which forms the bolt hole 3, and futility (disadvantage) arises in space. If the space which tries to achieve space-saving-ization and O ring 5 and the bolt 4 of the flange 2 are made small and in which an O ring and a bolt are formed is made small, the sealing nature in a piping flange part falls, or piping erection intensity runs short. Therefore, it was difficult to attain both space-saving-izing and sealing nature both with structure conventionally. The purpose of this invention is to provide the manifold of the fuel cell which can attain both space-saving-izing and sealing nature both.

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MEANS

[Means for Solving the Problem] This invention which attains the above-mentioned purpose is as follows.

(1) A manifold of a fluid formed in a stack which arranged and constituted an end plate to both ends of a cell layered product, A fluid passage which is formed in piping by which has a flange and the bolting join was carried out to an end plate of an end of said stack by this flange, and is open for free passage to a manifold in said stack, A manifold of a fuel cell with which it is a manifold of a fuel cell, ** and others, and a manifold part in an end plate of said stack end is aslant prolonged to a cell laminating direction among manifolds in said stack.

(2) A manifold of a fuel cell given in (1) which has offset the center of a fluid passage of a flange part of said piping at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of said stack.

(3) said -- piping -- said -- a stack -- a terminal area -- anode gas -- others -- a fluid -- an O ring -- constituting -- having -- a seal line -- being mutually-independent -- carrying out -- although -- said -- an O ring -- pressing down -- a piping flange -- mutual -- community -- having carried out -- (-- one --) -- a description -- a fuel cell -- a manifold .

[0005] In a manifold of a fuel cell of the above (1), a manifold part in an end plate of said stack end among manifolds in a stack, Since it has extended aslant to a cell laminating direction, with the former [arrangement / of a manifold of a cell layered product part], A terminal area of a manifold part in an end plate and a channel in piping can be made to offset in the direction which intersects perpendicularly with a cell laminating direction to a manifold of a cell layered product part, Between ends of a direction which intersects perpendicularly with a terminal area of a manifold part in an end plate, and a channel in piping, and a cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Since the center of a fluid passage of a flange part of piping has offset in a manifold of a fuel cell of the above (2) at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of a stack, Between ends of a direction which intersects perpendicularly with a terminal area of a manifold part in an end plate, and a channel in piping, and a cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion.

Therefore, both space-saving-izing and sealing nature reservation can be attained. Although it supposes that a seal line which comprises anode gas and other fluids with an O ring in a terminal area to a stack of piping is mutually-independent in a manifold of a fuel cell of the above (3), - izing of a flange and the seal part can be carried out [space-saving] by sharing a flange, securing prevention from a penetration of anode gas to a channel line of other fluids which let an O ring pass, since a piping flange which presses down an O ring was made mutual in common.

[0006]

[Embodiment of the Invention] Below, the fuel cell of this invention is explained with reference to drawing 1 - drawing 7. The fuel cell 10 of this invention is a solid polyelectrolyte type fuel cell.

The fuel cell 10 of this invention is carried, for example in a fuel cell electric vehicle. However, it may be used in addition to a car.

[0007]the electrode 14 (an anode.) which consists of the catalyst bed 12 and the diffusion zone 13 which have been arranged at the whole surface of the electrolyte membrane 11 which consists of ion-exchange membranes, and this electrolyte membrane 11 as the solid polyelectrolyte type fuel cell 10 is shown in drawing 1 and drawing 2the electrode 17 (a cathode.) which consists of the catalyst bed 15 and the diffusion zone 16 of a fuel electrode and the electrolyte membrane 11 which were alike on the other hand and have been arranged The film-electrode assembly (MEA:Membrane-Electrode Assembly) which consists of air poles, the electrodes 14 and 17 -- fuel gas (anode gas, hydrogen) and oxidizing gas (cathode gas.) oxygen and the fluid channel 27 (the fuel gas flow route 27A.) for usually supplying air A cell is formed for the separator 18 which forms the refrigerant passage (circulating-water-flow way) 26 through which the refrigerant the oxidizing gas passage 27B and for fuel cell cooling (cooling water) flows in piles, Carry out the plural laminates of this cell, consider it as the module 19, laminate the module 19, and a module group is constituted, The fastening member 24 (for example) which arranges the terminal 20, the insulator 21, and the end plate 22, constitutes the stack 23, binds the stack 23 tight to a laminating direction, and is prolonged on the outside of a cell layered product to the cell laminating direction both ends of module 19 group in a fuel cell layered product laminating direction A tension plate and a tension plate consist of what was fixed with the part and the bolt 25 of the stack 23. The refrigerant passage 26 is formed for every cell or two or more cells of every. For example, the one refrigerant passage 26 is formed every two cells.

[0008]The separator 18 forms the electric passage through which an electron flows into a cathode from the anode of an adjacent cell while separating mutually any of fuel gas, oxidizing gas and fuel gas, cooling water and oxidizing gas, and cooling water ** they are. That by which the separator 18 formed the refrigerant passage 26 and the gas passageway 27 (the fuel gas flow route 27a, the oxidizing gas passage 27b) in the carbon plate, Or it consists of either a thing which piled up two or more metal plates with the unevenness which forms the channels 26 and 27, or what [formed the refrigerant passage 26 and the gas passageway 27 in the resin board made from electric conduction (for example, resin board which mixed conducting material particles and gave conductivity)] **. The example of a graphic display shows the case where the separator 18 consists of carbon plates. The gas passageways 27 (the fuel gas flow route 27a, the oxidizing gas passage 27b) in a cell may be any of surface state channel ** between the group of one grooved channel or two or more parallel grooved channels, or the board of the couple separated by two or more projections.

[0009]As shown in drawing 3, drawing 5, and drawing 6, the refrigerant manifold 28 is formed in the fuel cell stack 23, and the refrigerant manifold 28 is open for free passage to the refrigerant passage 26 of a cell. A refrigerant flows into the refrigerant passage 26 from the refrigerant manifold 28 by the side of ON, and flows into the refrigerant manifold 28 by the side of appearance from the refrigerant passage 26. Similarly, the gas manifold 29 is formed in the fuel cell stack 23, and the gas manifold 29 consists of the fuel gas manifold 29a and the oxidation gas manifold 29b. The fuel gas manifold 29a and the oxidation gas manifold 29b are open for free passage to the fuel gas flow route 27a and the oxidizing gas passage 27b of a cell, respectively. Fuel gas flows into the fuel gas flow route 27a of a cell from the fuel gas manifold 29a by the side of ON, and flows into the fuel gas manifold 29a by the side of appearance from the fuel gas flow route 27a. Oxidizing gas flows into the oxidizing gas passage 27b of a cell from the oxidation gas manifold 29b by the side of ON, and flows into the oxidation gas manifold 29b by the side of appearance from the oxidizing gas passage 27b.

[0010]The stack 23 may be arranged at a level with two-row parallel, and the end plate 22 of the both ends of the stack 23 is shared to the stack 23 of two rows in that case. In the end plate 22 in the end of the stack 23. The refrigerant piping 30 supplied and discharged is connected to the refrigerant manifold 28 in the fuel cell stack 23 in the refrigerant (cooling water), and the gas piping 31 which supplies and discharges reactant gas at the gas manifold 29 in a fuel cell stack is connected. The gas piping 31 consists of the fuel gas piping 31a which supplies and discharges

fuel gas at the fuel gas manifold 29a in a fuel cell stack, and the oxidizing gas piping 31b which supplies and discharges oxidizing gas at the oxidation gas manifold 29b in a fuel cell stack. A refrigerant, fuel gas, and oxidizing gas enter and make a U-turn to a fuel cell stack from the end plate 22 in the end of the stack 23, and come out of the same end plate 22.

[0011]In the case of 1 stack fuel cell, a refrigerant (cooling water) goes into the stack 23 in the lower part of the longitudinal-direction end of the end plate 22 from the ON side refrigerant piping 30, and flows out of the stack 23 into the appearance side refrigerant piping 30 in the upper part of the longitudinal-direction end of the end plate 22. Fuel gas goes into the stack 23 in the upper part of the longitudinal-direction end of the end plate 22 from the ON side fuel gas piping 31a, and flows out of the stack 23 into the appearance side fuel gas piping 31a in the lower part of the longitudinal-direction end of the end plate 22. Oxidizing gas goes into the stack 23 in the lower part of the longitudinal-direction end of the end plate 22 from the ON side oxidizing gas piping 31b, and flows out of the stack 23 into the appearance side oxidizing gas piping 31b in the upper part of the longitudinal-direction end of the end plate 22. In the case of 2 stack fuel cell, the appearance side fuel gas piping 31a is arranged to a central site, a two and ON side arranges symmetrically 1 stack fuel cell for which the above-mentioned piping configuration is taken, and, as for an end plate, the structure established one in common to the stack on either side is taken.

[0012]The pressure plate 32 is formed inside the end plate 22 in the other end of the stack 23, and the spring mechanism (for example, belleville spring mechanism) 33 which absorbs change of stack clamp load is formed between the pressure plate 32 and the end plate 22. Piping of a refrigerant and reactant gas is not connected to the end-plate 22 side in the other end of the stack 23.

[0013]The manifolds 28 and 29 of the fluid formed in the stack 23 as shown in drawing 3 - drawing 5, The fluid passage 35 which is formed in the piping 30 and 31 which has the flange 34 and was concluded by the end plate 22 of the end of the stack 23 with the bolt 36 by the flange, and is open for free passage to the manifolds 28 and 29 in the stack 23, In the manifold of the fuel cell, ** and others, the manifold part which is in the end plate 22 of a stack end among the manifolds 28 and 29 in the stack 23 is aslant prolonged to the cell laminating direction. As for the manifold part in the end plate 22, the manifold axis should just be prolonged aslant, As shown in (A) of drawing 5, include the case where the manifold each-side-walls side has extended aslant in parallel on both sides of the manifold axis, and also as shown in (A') of drawing 5, It contains, also when one wall surface extends in a cell laminating direction among the manifold each-side-walls sides which sandwiched the manifold axis and the wall surface of another side has extended aslant (direction which approaches in the center of an end plate, so that it goes to the cell laminating direction outside).

[0014]The center of the fluid passage 35 of flange 34 portion of the piping 30 and 31 is offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifolds 28 and 29 of the cell layered product portion of the stack 23 (in direction which separates from an end-plate end). The manifold part aslant prolonged to a cell laminating direction within the end plate 22 of a stack end is a manifold part in the longitudinal-direction end of the end plate 22 of a stack end. Therefore, in the single end plate 22 provided in the end part of the stack which carried out parallel arrangement of the two stacks in common to a right-and-left stack, the manifold part provided in the longitudinal-direction center-section side of the end plate does not need to be prolonged aslant.

[0015]While the bolthole 38 is formed, O ring groove 39 is formed in the flange 34 of the piping 30 and 31, O ring 37 is arranged on O ring groove 39, and the seal of the doubling part of the piping 30 and 31 and the flange 34 is carried out to it. Each size of the flange 34, the bolthole 38, the O link groove 39, and O ring 37 and the interval between each are equal to a required size and interval on the sealing nature and intensity which were shown in the comparative example of (B) of drawing 5 (there is no manifold prolonged aslant), or size from it. In that case, although a flange end part comes by the comparative example of (B) of drawing 5 outside the end of a cell layered product, a flange end part comes to the position of the end of a cell layered product by this invention working example of (A) of drawing 5, and (A') mostly.

[0016]As shown in drawing 6 and drawing 7, the seal line (O ring groove of 39 lines) which comprises anode gas and other fluids with O ring 37 in the terminal area to the stack 23 of the piping 30 and 31 is mutually-independent, but the piping flange 34 which presses down O ring 37 is made mutual in common. By [of the flange 34] having presupposed that it is common, the bolt 40 between the manifolds which adjoin the manifold of anode gas and it is good also as two, as shown in drawing 7 from four were shown in drawing 4. When it is considered as two bolts, the further space-saving-ization is achieved compared with four bolts, and piping erection structure is simplified.

[0017]Below, an operation of the manifold of the fuel cell of this invention working example is explained. First, the manifold part in the end plate 22 of the stack end among the manifolds 28 and 29 in the stack 23, Since it has extended aslant to the cell laminating direction, arrangement of the manifold of a cell layered product part is left the former, The terminal area P of the manifold 28 in the end plate 22, 29 portions, and the channel 35 in piping can be made to offset in the direction which intersects perpendicularly with a cell laminating direction to the manifold of a cell layered product part (a position is shifted), Between the ends Q of the direction which intersects perpendicularly with the terminal area P of the manifold part in the end plate 22, and the channel 35 in piping, and the cell laminating direction of the end plate 22, A bigger (when the manifold in an end plate is not prolonged aslant) space than the case of the comparative example B of drawing 5 is securable, and it can allocate easily, without miniaturizing flange 34 portion and O ring 37 portion into the portion. Therefore, while being able to attain space-saving-ization, sufficient sealing nature is securable.

[0018]When offset, the center P of the fluid passage 35 of flange 34 portion of the piping 30 and 31. Since it has offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifold of the cell layered product portion of the stack 23, Between the ends Q of the direction which intersects perpendicularly with the terminal area P of the manifold part in the end plate 22, and the channel 35 in piping, and the cell laminating direction of the end plate 22, A bigger (when the manifold in an end plate is not prolonged aslant) space than the case of the comparative example B of drawing 5 can be secured, and it becomes it is reasonable and possible to allocate flange 34 portion and O ring 37 portion in the portion. Therefore, both space-saving-izing and sealing nature reservation are attained.

[0019]In the manifold of the fuel cell of drawing 6 and drawing 7. Since the seal line which comprises anode gas and other fluids with O ring 37 in the terminal area to the stack 23 of the piping 30 and 31 is made mutually-independent, the penetration to the manifold of other fluids of hydrogen gas which let O ring 37 pass can be prevented. Since the piping flange 34 which presses down O ring 37 was made mutual in common, a flange and a seal part are made space-saving.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a side view of the fuel cell with which the manifold of the fuel cell of this invention was applied.

[Drawing 2]They are some expanded sectional views of the fuel cell of drawing 1.

[Drawing 3]It is a perspective view of the fuel cell with which the manifold of the fuel cell of this invention was applied.

[Drawing 4]It is the front view seen from the end-plate side of the side to which piping of the fuel cell of drawing 3 is attached.

[Drawing 5]It is a sectional view of the sectional view (this invention) which meets (A) A-A line of the fuel cell of drawing 4, another example included in this invention (A'), and the (B) comparative example (a comparative example is not included in this invention).

[Drawing 6]It is a perspective view of the fuel cell with which the manifold of the fuel cell of this invention was applied.

[Drawing 7]They are an end plate part of the end of the fuel cell of drawing 6, and some perspective views of the flange of piping attached to it.

[Description of Notations]

10 (Solid polymer electrolyte type) Fuel cell

11 Electrolyte membrane

12 Catalyst bed

13 Diffusion zone

14 Electrode (an anode, a fuel electrode)

15 Catalyst bed

16 Diffusion zone

17 Electrode (a cathode, an air pole)

18 Separator

19 Module

20 Terminal

21 Insulator

22 End plate

23 Stack

24 Tension plate

25 Bolt

26 Refrigerant passage

27 Gas passageway

27a Fuel gas flow route

27b Oxidizing gas passage

28 Refrigerant manifold

29 Gas manifold

29a Fuel gas manifold

29b Oxidation gas manifold

30 Refrigerant piping

- 31 Gas piping
- 31a Fuel gas piping
- 31b Oxidizing gas piping
- 32 Pressure plate
- 33 Spring mechanism
- 34 Flange
- 35 The fluid passage in piping
- 36 Bolt
- 37 O ring
- 38 Bolthole
- 39 O ring groove

[Translation done.]

* NOTICES *

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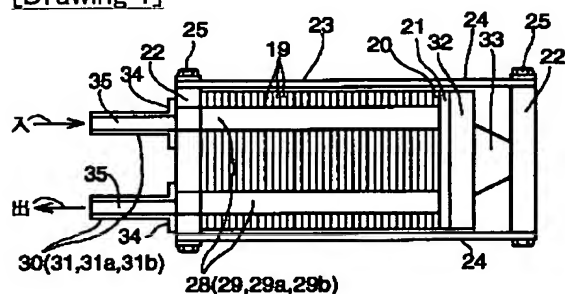
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

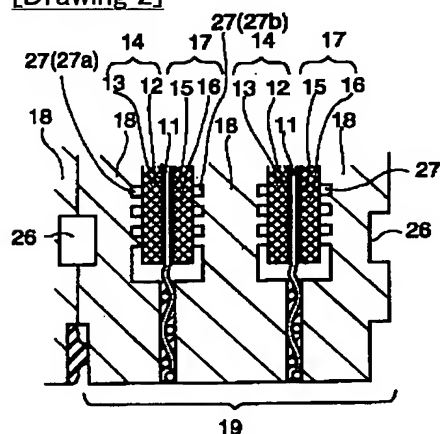
3.In the drawings, any words are not translated.

DRAWINGS

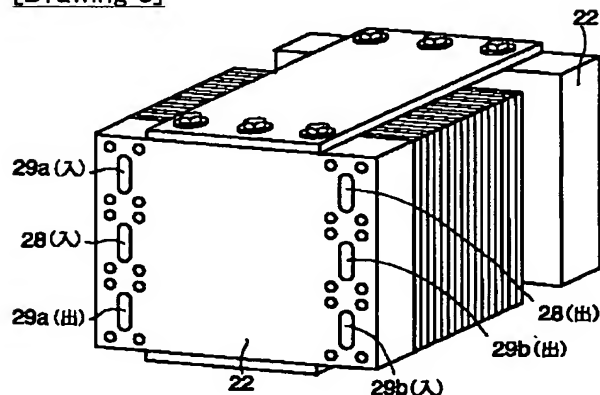
[Drawing 1]



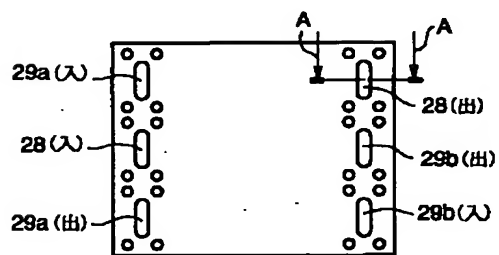
[Drawing 2]



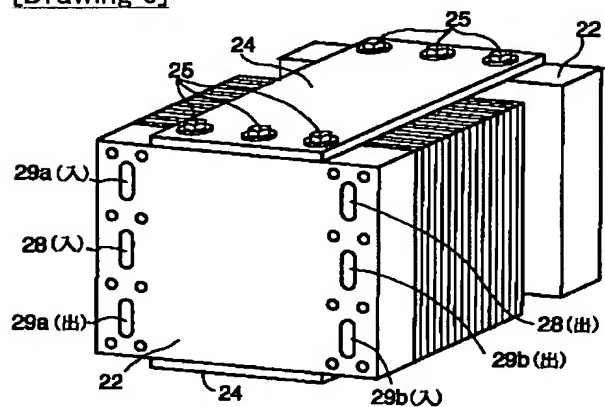
[Drawing 3]



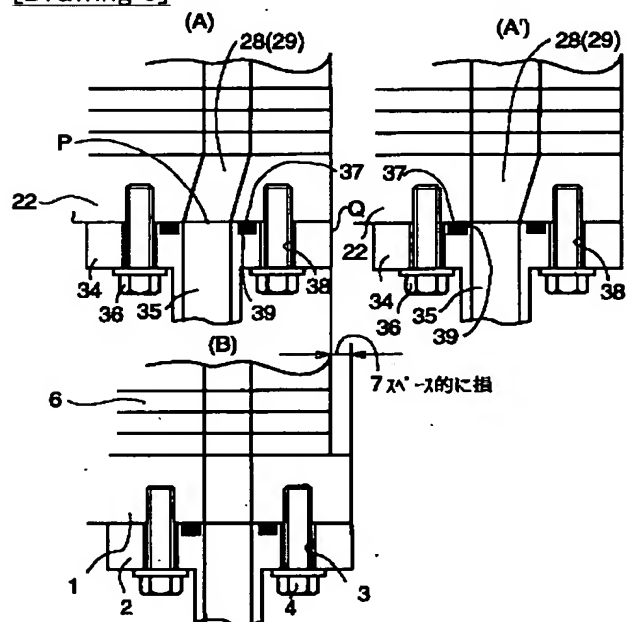
[Drawing 4]



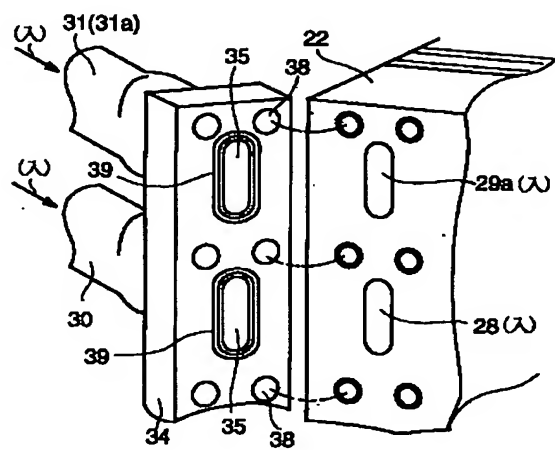
[Drawing 6]



[Drawing 5]



[Drawing 7]



[Translation done.]